

REMARKS

Status of the Claims

Claims 1-7 are pending in the subject application with claim 1 being independent. Claims 8-26 are withdrawn pursuant to the restriction requirement. Claims 1, 4, 5, and 7 have been amended to even more clearly recite and distinctly claim the present invention.

Applicants respectfully request the Examiner to withdraw the outstanding rejections in view of the foregoing amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 102

Claims 1, 4-5 and 7 are rejected under 35 U.S.C. 102(b) as allegedly being anticipated by US Patent No. 6,528,167 (“O’Gara”). Applicants respectfully disagree; therefore, this rejection is respectfully traversed.

Independent claim 1 recites nanoscale or mesoscopic particles comprised of an inorganic material, wherein the surface thereof is divided into two zones Z1 and Z2, the zone Z1 carries groups F1 and the zone Z2 carries groups F2 different from the groups F1, the zone Z1 being free of groups F2 and the zone Z2 being free of groups F1, the zone Z1 and the zone Z2 being regionally distinct from each other.

The presently claimed invention relates to nanoscale or mesoscopic particles comprising an inorganic material, characterized in that the surface thereof is divided into two zones Z1 and Z2 with different functional groups F1 and F2. Accordingly, these particles have at least two distinct zones with different functional groups attached thereto. These particles have the advantage of carrying, in a regioselective manner, two chemically or biochemically different functionalities. Accordingly, these particles have at least two distinct zones, never overlapping each other, since claim 1 already indicates that the zone Z1 is free of groups F2 and the zone Z2 is free of groups F1.

In contrast, O’Gara describes porous inorganic/organic hybrid materials useful for chromatographic separations. O’Gara discloses porous inorganic/organic hybrid particles in which the inorganic portion is hybrid silica of formula $\text{SiO}_2/(\text{R}^1_p\text{R}^2_q\text{SiO}_t)_n$ or $\text{SiO}_2/[\text{R}^3(\text{R}^1_r\text{SiO}_t)_m]_n$ (see col. 3 lines 43-55). O’Gara discloses that a “bonded phase” can be

formed by adding functional groups to the surface of hybrid silica, for example by reacting the surface silanol groups with a reactive organosilane, for example halo or alkoxy substituted silanes thus producing Si-O-Si-C linkage (col. 3, lines 56-62). O’Gara then recites from col. 4, line 60 to col.5, line 50, the different functionalizing groups that can be bonded at the surface of the hybrid silica.

However, O’Gara never discloses or suggests that the surface of the particles exhibit distinct zones each bearing a specific functional group different from the group grafted on the other zone.

The Examiner specifically points out the passage of O’Gara that states that only a maximum of 50% of the Si-OH groups of the silica surface can react with the trimethylsilyl entity and less with larger entities such as the octadecylsilyl groups. From this disclosure, the rest of the surface Si-OH groups remain unmodified. However, this disclosure does not mean that the rest of the surface Si-OH groups are functionalized with a functionalizing group that is different from the group functionalizing the Si-OH groups of the silica surface. O’Gara is merely disclosing that a portion of the Si-OH groups remain unmodified. Moreover, this disclosure does not mean that the Si-OH groups that remain unmodified are regionally distinct from the surface Si-OH groups are functionalized with a functionalizing group. Applicants respectfully submit that according to the disclosure of O’Gara, the Si-OH groups that remain unmodified are inter-mixed with the Si-OH groups that are functionalized.

O’Gara discloses that the remaining silanol groups that have not reacted with functionalizing groups can be end-capped, for example, with a small silylating agent such as trimethylchlorosilane (col. 5, line 51 – col. 6, line 3). It is noted that the goal of end-capping is to remove as many residual silanols as possible to avoid any undesirable adsorption of basic or ionic compounds. However, the end-capping of the silanol groups is not regioselective and cannot lead to particles exhibiting two regionally distinct zones Z1 and Z2 respectively functionalized with a specific functionalizing groups F1 and F2. As noted above, the Si-OH groups that remained unmodified and thus eventually end-capped are inter-mixed with the Si-OH groups that are functionalized.

Accordingly, O’Gara does not disclose or suggest nanoscale or mesoscopic particles comprised of an inorganic material, wherein the surface thereof is divided into *two zones* Z1 and

Z2, the zone Z1 carries groups F1 and the zone Z2 carries groups ***F2 different from the groups F1***, the zone ***Z1 being free of groups F2*** and the zone ***Z2 being free of groups F1***, the zone Z1 and the zone Z2 being ***regionally distinct*** from each other.

Therefore, for at least the reasons noted above, O’Gara does not anticipate the subject matter of claims 1, 4, 5, and 7 and Applicants respectfully request that this rejection be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

Claims 2-3 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over US Patent No. 6,528,167 by O’Gara. Applicants respectfully disagree; therefore, this rejection is respectfully traversed.

As described above, independent claim 1 recites nanoscale or mesoscopic particles comprised of an inorganic material, wherein the surface thereof is divided into two zones Z1 and Z2, the zone Z1 carries groups F1 and the zone Z2 carries groups F2 different from the groups F1, the zone Z1 being free of groups F2 and the zone Z2 being free of groups F1, the zone Z1 and the zone Z2 being regionally distinct from each other.

In contrast, O’Gara describes porous inorganic/organic hybrid materials useful for chromatographic separations. O’Gara discloses porous inorganic/organic hybrid particles in which the inorganic portion is hybrid silica of formula $\text{SiO}_2/(\text{R}^1_p\text{R}^2_q\text{SiO}_t)_n$ or $\text{SiO}_2/[\text{R}^3(\text{R}^1_r\text{SiO}_t)_m]_n$ (see col. 3 lines 43-55). O’Gara discloses that a “bonded phase” can be formed by adding functional groups to the surface of hybrid silica, for example by reacting the surface silanol groups with a reactive organosilane, for example halo or alkoxy substituted silanes thus producing Si-O-Si-C linkage (col. 3, lines 56-62).

As described above, O’Gara never discloses or suggests that the surface of the particles exhibit distinct zones each bearing a specific functional group different from the group grafted on the other zone. O’Gara does not disclose or suggest nanoscale or mesoscopic particles comprised of an inorganic material, wherein the surface thereof is divided into ***two zones*** Z1 and Z2, the zone Z1 carries groups F1 and the zone Z2 carries groups ***F2 different from the groups F1***, the zone ***Z1 being free of groups F2*** and the zone ***Z2 being free of groups F1***, the zone Z1 and the zone Z2 being ***regionally distinct*** from each other.

Applicants further respectfully note that the method of preparation of the particles of O’Gara can not provide particles having distinct zones functionalized with different functionalized agent, especially as presently claimed a zone Z1 being free of groups F2 and a zone Z2 being free of groups F1.

The preparation method of O’Gara involves steps that are carried in solution without masking any part of the surface of the particles. Therefore, the result is that the functionalizing groups are allowed to graft randomly on any part of the surface, the limiting factor being the number of SI-OH groups able to react with the functionalizing entity.

Accordingly, O’Gara contains absolutely no teaching or suggestion of specific zones bearing different functionalizing groups created at the surface of spherical particles.

Therefore, for at least the reasons noted above, the present claims are not obvious in view of O’Gara and Applicants respectfully request that this rejection be withdrawn.

Claims 1 and 6 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over US Patent Pub. No. 2003/0031438 (“Kambe”).

As described above, independent claim 1 recites nanoscale or mesoscopic particles comprised of an inorganic material, wherein the surface thereof is divided into two zones Z1 and Z2, the zone Z1 carries groups F1 and the zone Z2 carries groups F2 different from the groups F1, the zone Z1 being free of groups F2 and the zone Z2 being free of groups F1, the zone Z1 and the zone Z2 being regionally distinct from each other.

Kambe relates to structures formed with polymer-inorganic particle blends, including polymer-inorganic particles composites with bonding between the particles and the polymer. In particular, Kambe discloses an optical structure comprising an interface between a first optical material and a second optical material each of which comprises a polymer. The first optical material comprises a polymer-inorganic particle blend, wherein the blend comprises inorganic particles that, when isolated, are electrical insulators or electrical conductors.

The inorganic particles generally include metal or metalloid elements in their elemental form or in compounds, and also carbon particles such as fullerenes, carbon black, graphite and combinations thereof (page 3, paragraph [0054]).

These particles can be simply mixed with polymers, or be in the form of blend comprising polymer-inorganic particles composites with chemical bonding between particles and the polymer (paragraph [0056]). In the case of chemical bonding, the polymer includes or is modified to include appropriate functional groups to chemically bond with the inorganic particles or with functional groups of a linker compound (paragraphs [0057] and [0076]).

In paragraph [0078], it is stated that polymer-inorganic particle composites, as well as polymer-inorganic particle blends, can comprise a plurality of different polymers and/or a plurality of different inorganic particles. Kambe then specifies that if a poly-inorganic particle blend comprises a plurality of different polymers and/or a plurality of different inorganic particles, all of the polymer and/or inorganic particles can be chemically bonded within the composite or, alternatively, only a fraction of the polymers and inorganic particles can be chemically bonded within the composite. And if only a fraction of the polymers and/or inorganic particles are chemically bonded, the fraction bonded can be a random portion or a specific fraction of the total polymer and/or inorganic particles. In this embodiment, the term “fraction” relates to polymer or to particles, not to the surface of particles.

Therefore, these passages specifically commented on by the Examiner are not particularly relevant because these passages neither disclose nor suggest that one particle can have a specific zone Z1 of its surface functionalized with a functional group F1 and a specific zone Z2 of its surface functionalized with a functional group F2, Z1 being free from F2 groups and Z2 being free from F1 groups.

In addition, the method disclosed in Kambe to prepare the polymer-inorganic particle blends can not provide the presently claimed particles defined by claim 1 because in Kambe the particles are simply distributed with the polymer material such that the resulting blend forms a single material (paragraphs [0126]-[01139]).

Accordingly, Kambe does not disclose or suggest nanoscale or mesoscopic particles comprised of an inorganic material, wherein the surface thereof is divided into *two zones* Z1 and Z2, the zone Z1 carries groups F1 and the zone Z2 carries groups *F2 different from the groups F1*, the zone *Z1 being free of groups F2* and the zone *Z2 being free of groups F1*, the zone Z1 and the zone Z2 being *regionally distinct* from each other.

Therefore, for at least the reasons noted above, the present claims are not obvious in view of Kambe and Applicants respectfully request that this rejection be withdrawn.

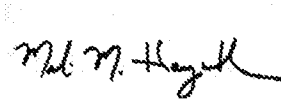
Conclusion

For at least the reasons noted above, the art of record does not disclose or suggest the inventive concept of the present claims.

In view of the foregoing amendments and remarks, reconsideration of the claims and allowance of the subject application is earnestly solicited. If there are any questions relating to this response or the application, it would be appreciated if the Examiner would telephone the undersigned attorney.

If necessary for a timely response, this paper should be considered as a petition for an Extension of Time. Please charge any deficiency in fees or credit any overpayments to Deposit Account No. 13-2725 (Docket # 70206.0043FPWO).

Respectfully submitted,



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